Brown Rot of Stone Fruits. *Sclerotinia cinerea* (Bon.) Schrot. This disease was only reported on plums the past season, but no doubt it occurred on cherries and peaches where there was a crop. Little twig injury has ever been observed and cankers on peach are rare.

Cherry Fruit Disease. *Bacterial.* Two reports came to the writer's attention the past season, where a new cherry fruit trouble seemed to be causing damage. The fruit showed indications of a bacterial infection, being attacked when about half grown. The cultures obtained, however, did not give positive results upon inoculation. Further work is necescary to prove its real cause.

Peach Leaf Curl. *Exoascus deformans* (Berk.) Fckl. This was present in very limited quantities the past season on the foliage of the peach tree. In this state only the foliage is attacked.

Red Cedar Blight. *Phoma sp.* This made its appearance in 1916 for the first time in the cold frames of the nursery. Seedlings began dying at the tips. The symptom was a regular blight and frequently involved the entire seedling.

WINTER INJURY TO PLANTS.

As a whole, considerable winter injury occurred to evergreens and deciduous trees over the state. It was particularly serious among the cedars in many cases, and hedges and trees were severely injured. Later in the season the plants outgrew this. The injury was prevalent in many cases on the north or northwest exposure.

Agricultural Experiment Station, Manhattan.

Water Relations of Corn and the Sorghums.

EDWIN C. MILLER.

The statement that the sorghum plants produce a crop of both forage and grain under conditions that are prohibitive to the growth and maturity of the corn plant, needs no explanation to a Kansas audience. That the sorghums have been one of the most potent factors in the development of dry farming in the central and southern portion of the great plains during the past fifteen years, is unquestionable.

A knowledge of the characters that enable these plants to grow and develop under the conditions of the great plains, would be of value to those engaged in the breeding and development of plants for the semi-arid regions. In view of these facts, a series of investigations have been conducted during the past four years, in order to determine the fundamental characteristics possessed by the sorghum plants, which enable them to withstand severe climatic conditions better than the corn plant. These experiments were carried on at the State Branch Experiment Station at Garden City. This station is well suited for an experiment of this type, since the severity of the climatic conditions during the summer months is exceeded little or not at all by any other point in the great plains area. It is intended in this paper simply to summarize the results that have thus far been obtained in these experiments.

ROOT SYSTEMS.

The root systems of Pride of Saline corn, Blackhull kafir and Dwarf milo plants, which were grown in alternate rows, were isolated in the field at four stages of growth in 1914, and at three stages of growth in 1915. All told, the root systems of thirty-three plants were isolated and studied. It was found that for a given stage of growth each plant possessed the same number of primary roots, and that the general extent of these roots in both a horizontal and vertical direction was the same for all three plants. The maximum depth of root penetration for mature Dwarf milo, Blackhull kafir and corn was found to be six feet for both the years 1914 and 1915. It was found that Blackhull kafir and Dwarf milo possessed approximately twice as many secondary roots per unit or primary root as did the corn plant. This was true, not only for both years, but also for all stages of the root systems examined. Both the primary and secondary roots of the sorghums were found to be more fibrous than those of the corn plant.

LEAF AREA.

The average leaf areas of five representative plants of corn, Blackhull kafir and Dwarf milo, were obtained at stages when the plants were four, six, eight and ten weeks of age. The last stage examined showed that the plants had completed their full leaf development. In all stages of growth the corn plant was found to have the greatest leaf area. Taking the stages of growth in order, one finds that the leaf area of the corn plant was 1.7, 2.0, 2.2 and 2.3 times the leaf area of Dwarf milo, and 1.6, 1.9, 1.5 and 1.5 times that of Blackhull kafir.

VARIATION OF WATER AND DRY MATTER IN THE LEAVES.

The variation of the water and dry matter in the leaves of corn and the sorghums was determined by nine experiments in 1914, two in 1915 and four in 1916. These experiments were conducted with plants of Pride of Saline corn, Blackhull kafir and Dwarf milo, which were grown in the field either in a series of plots, or in alternate rows on the same plot. Four of the experiments in 1914 extended only through the daylight hours, but all the other experiments ranged in length from twenty-four to forty-eight hours. In these experiments the water and dry matter in the leaves were determined every two hours during twenty-two days and ten nights. The amount of water in the leaves of milo was found to be much lower at all times of the day and night than that of either corn or kafir leaves at a like stage of development, while the average water content of the corn and kafir leaves at the same age was practically the same. The water content of the leaves of corn, kafir and milo averaged 118, 129, 107 gms., respectively, for each square meter of leaf during the day periods, and taken in the same order, 128, 133, and 116 gms. for the night periods. The average range between the maximum water content of the leaves during the night and the minimum amount during the day was 24 gms. for corn, 26 gms. for kafir and 22 gms. for milo.

The dry weight of a given area of milo leaf was always found to be greater than an equal area of either corn or kafir leaves at the same

stage of development. The average dry weight of a square meter of leaf for all the observations made was 48 gms. for corn, 53 gms. for kafir and 56 gms. for milo. The average difference between the minimum and maximum amount of dry matter in the leaves for each square meter of leaf from 7 a. m. to 7 p. m. was 4.5 and 8.0 gms., respectively, for corn, kafir and milo. The increase in dry matter began at daybreak, and the maximum amount of dry matter in the leaves occurred in most cases between 2 and 5 p. m. The rate of increase of the dry matter in the leaves during the portion of the day when the climatic conditions were severe was much higher for milo than for either corn or kafir.

COMPARATIVE TRANSPIRATION.

Five experiments were conducted in 1916 and eight in 1917 to determine the relative transpirations of corn and the sorghums. Pride of Saline corn, Blackhull kafir, Dwarf Blackhull kafir and Dwarf milo were used in 1916, and in 1917, in addition to these, Freed's White Dent corn, Sherrod's White Dent corn, Freed's sorgo, Red Amber sorgo and feterita were used. The plants were grown in large galvanized iron cans with a capacity of about 120 kilos of soil. The soil used in 1916 had a water content of 18 per cent and a wilting coefficient of 11.1, while the moisture content of the soil used in 1917 was 22 per cent and had a wilting coefficient of 15.1.

The transpiration was determined in most of the experiments every two hours from 7 a. m. to 7 p. m. Each experiment extended through two or three days. In 1916 the cans were placed in the open on the surface of the ground, but in 1917 they were placed in a pit in the center of a plot that was planted to corn. The pit was of such a depth that the top of the cans were on a level with the surface of the ground.

Blackhull kafir and Dwarf Blackhull kafir always had the lowest rate of transpiration per unit of leaf surface in the experiments in which these plants were used. All the varieties of corn used always transpired more water per plant during any given period than did any of the sorghums. Their rate of transpiration per unit of leaf surface was, with the exception of the kafirs, always lower than that of the sorghums. The rate of transpiration per unit of leaf surface for feterita, Dwarf milo, Freed's sorgo and Red Amber sorgo was much higher than that of the corn plant under the same conditions. The difference in the transpiration rate of corn and the sorghums was more marked when the plants had reached their full leaf development and the difference in leaf surface of these plants had reached a maximum. The difference in the transpiration rate per unit of leaf surface was always more evident under severe climatic conditions than under conditions where the evaporation was low.

SUMMARY.

In comparing the corn and sorghum plants, it will be seen that in all stages of their growth the sorghum plants have a primary root system that is just as extensive as that of the corn plant. In addition, the sorghums possess twice as many secondary roots as the corn at any stage of its growth. The leaf area of the corn plant at all stages of its growth is approximately twice as great as that of the sorghums.

The sorghum plants thus have the advantage over the corn plant under any climatic condition that would tend to bring about a loss of water from these plants. The sorghums have, in the first place, as compared to the corn plant, only one-half the leaf surface exposed for the evaporation of water; and in the second place, they have a root system which, judging from the number of secondary roots, would be twice as efficient in the absorption of water from the soil. As a result of this advantage the sorghum plants are able to absorb water from the soil as rapidly as the evaporating power of the air demands its removal from the leaves. The corn plant, on the other hand, is not capable of supplying its large extent of leaf surface with a sufficient amount of water to satisfy the evaporating power of the air, and, as a result, its rate of transpiration per unit of leaf surface falls below what it would be if the needed amount of water were supplied, and is thus lower than that of the sorghums.

As a farther result of the water supply in the leaves, the sorghums can produce more dry matter for each unit of leaf area under severe climatic conditions than the corn plant.

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The Wamego Anticline.

J. W. Beede.

In examining the region west of Wamego an anticline fold or arch of considerable dimensions was found. It lies west of Wamego and Louisville and largely east of St. George. The outline of the apex of this fold is very difficult to determine on account of the rocks being deeply covered with loose glacial material, so that few rock exposures exist over the territory. However, along the Kansas river this material has been carried away sufficiently to reveal the surface strata. An occasional exposure and the dips of the starta in the region adjoining indicate fairly clearly the location of the axis, or top, of the dome.

The total extent of the field is very great, reaching from the vicinity of Manhattan on the west well toward St. Marys on the east, and a proportional distance toward Westmoreland on the north. However, the apex of the dome—the part of most importance—is fairly limited in extent. This central part would serve as the reservoir of all these great collecting grounds. The rim of this central part begins just east of St. George, extending north along the west side of sections 4, 33, 28 and 21, townships 9 and 10 south, range 9 east. From here it seems to swing eastward in a semicircular curve through section 10, the north side of sections 14, 13 and 18, then to the south across section 19 and the west side of 20, south through 29, 32, 5, 8 and 17 to the river.

The most important part of the fold probably is to be found in sections 1, 2, 11, 12, 13, 14 and the east half of 3, 10 and 15, township 10 south, range 10 east. The rocks of this dome have an elevation at the center of nearly 300 feet above their altitude at their extreme limits of the fold, thus furnishing a considerable relief and capacity for the collection of gas or oil, should these products occur in the rocks below.